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BRACHIOPODS OF THE ALPINE TRIAS.

Brachiopoden der Alpinen Trias. Von A. Bittner. *Abhandl. d. k. k. geologischen Reichsanstalt,* Bd. xiv. 4to, 325 pages, 41 plates, and numerous zincotypes in the text. (Vienna: A. Hölder, 1890.)

BOOKS on Triassic fossils, helping as they do to bridge over the gap in our knowledge of those life-forms that led from the ancient times to the middle ages of earth-history, will always be welcomed by both geologist and biologist, especially when, as in the fine work before us, they show signs of wide learning and elaborate research, and are accompanied by such figures and diagrams as place their stores of information within easy reach of all.

The Triassic rocks and Brachiopods best known to English collectors, and indeed to geologists in general, through the writings of Münster, v. Klipstein, and Laube on the one hand, and Suess and Zugmayer on the other, are those of the St. Cassian argillaceous beds and of the Hallstatt limestone. Besides these, the Brachiopods of the Alpine Muschelkalk have been largely worked out by Schauroth and Boeckh. In addition to those from these well-known horizons, Mr. Bittner surveys the Brachiopod faunas from a large number of other beds, including the Rhætic, few of which beds have been systematically worked before, but all of which may be compared with those of the above-mentioned better-known types.

Mr. Bittner has divided his work into two parts: the first, of 287 pages, being devoted to the description of species and the comparison of faunas; the second dealing with the morphology and distribution of the several genera. It will be convenient to follow a similar order in this article.

Part I. follows primarily a stratigraphical, and secondarily a topographical arrangement, so that the species are described under various faunas. In one place, however, the author stops to give us two interesting essays, one on his new genus *Halorella,* the other on the Triassic species of *Rhynchonella,* both of which should by rights have come in the second part of his work.

The descriptions are based chiefly on materials in the Museum of the Geologische Reichsanstalt and the Hofmuseum in Vienna, although a very large number of other collections—private and public—have been consulted by the author. Among these, however, we fail to notice the British Museum, which contains many of v. Klipstein's types. Mr. Bittner, it should be mentioned, invites collectors and others to send him all their material, and promises to determine the species carefully and to describe any new ones. The present volume is sufficient guarantee that the work will be carefully done.

It may well be imagined that the task set before our author was no light one. There appear to be 398 species of Brachiopods in the Trias of the Alps, and of these 216 are named for the first time in this work. But we wish that Mr. Bittner had made his book a little more of what one expects it to be from its size and scope—namely, a monograph of the Brachiopods of the Alpine Trias. Such a monograph would have included a diagnosis, if not a figure, of every species of Brachiopod known to occur in these beds; it would have summarized the literature of the subject, and it would have shown at a glance under each species in what beds and at what localities it occurred. Such a work, which need not have been a page longer than the present, would have been worth a library to students of these fossils. The author, however, has elected merely to crowd our shelves with one more book, and not even a book in the highest sense of the word. He has unfortunately not thought it necessary to give even descriptions of previously named species, unless he has something new to say about them, while his whole volume is innocent of any serious attempt at a diagnosis. Here is an example—no unfavourable one—of his method:—

> “*Rhynchonella Attilina,* nov. sp.”
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> “A small *Rhynchonella* occurring in numbers, which at first sight reminds one of the above-described *Rh. trinodosi m.* The simplest examples are very near that species and easily confused with it.”

He then goes on to contrast *R. Attilina* with *R. trinodosi,* point by point, for twenty-seven lines, and so ends without any independent description of his new species, and with nothing to say how it differs from the ninety other Triassic species of the genus, not to mention the rest. And there are many worse instances than this.

We are aware that Mr. Bittner is by no means the only offender in this respect; were he so, our complaints would be unnecessary. He is merely an example of a body of writers, far too numerous in our own country, who seem to have the notion that this sort of thing is science. It is what science has to put up with, and if possible to make science out of; but there is generally about as much science in it as in an auctioneer's catalogue. The writers in question seem never to have heard of Linnæus. Had they studied his writings, they would understand that, for systematic purposes, the diagnosis is everything, that every new species described often necessitates a re-diagnosing of all other species in the genus, and in many cases involves a fresh diagnosis of the genus itself. Were this appreciated, fewer synonyms would disgrace our lists.

To return to Mr. Bittner, whose work is after all more scientific than that of most of these name-mongers. It is noticeable that he, as a rule, gives no measurements, leaving it to readers to gather these from the plates. The task of calculating average measurements is of course irksome; still it is often possible to compare species more accurately by their means than by any other.

Neither does our author ever take the trouble to inform us of the meanings of his trivial, or even generic names. “Why *R. trinodosi?*” we ask, and infer—though from nothing under the head of the species itself—that it is due to the association of the species with *Ceratites trinodosus.* But there are many names that still remain to the present writer unsolved enigmas: such are *S. pia, S. avarica* (unless this means *avaricensis*), and *R. generosa.* It is also rather difficult to understand why three species of Rhynchonella, all from the same district, should be called *R. cimbrica, R. teutonica,* and *R. venetiana.* We venture to think, however, that the climax of nomenclatural aberration is reached in such a name as “*Ko-*

ninckina Leopoldi Austriæ nov. spec." Here the author is following the bad example of "*Spiriferina Maximiliani Leuchtenbergensis* Klipstein *sp.*," and similar preciosities of the older writer. If emperors and dukes need such distinctive appellations, what must be done for ordinary mortals? Some day we shall see "*Robinsonia Gulielmi-Smithi-South-Kensingtonensis* Jones *sp.*" Seriously, no amount of snobbishness can make these names binomial. Mr. Bittner will need no apology for these remarks, for he has written:—

> "Es wäre nur zu wünschen, dass man sich auch gegen andere . . . Uebelstände und Missbräuche in der Nomenclatur . . . in so eifriger Weise aussprechen . . . möchte."

In his investigations into the internal structure of some of these Brachiopods the author has received much help from the researches of Mr. H. Zugmayer, many of which are here published for the first time. Like the Rev. Norman Glass, Mr. Zugmayer has devoted much attention to the shape of the lophophoral support. While Mr. Glass, however, works his specimens out by careful dissection, Mr. Zugmayer adopts the fashionable method of cutting a series of sections. Morphologists, as we know, look down on palæontologists, and their real reason is that the latter cannot use the Caldwell microtome; but the figures here published will go far to remove that reproach. One could wish, however, for more diagrams elucidating the results obtained by the sections.

The author has made a large number of new subgenera and a few new genera, the details of which are too technical for reproduction here. The following forms may be noted as strictly characteristic of the Trias:—The Koninckinidæ, especially *Koninckina* and *Amphiclina;* the Thecospiridæ; certain Rhynchonellidæ, viz. *Halorella*, *Dimerella*, and the subgenera *Austriella* and *Norella; Camerothyris* and *Cruratula*, which are two subgenera of *Waldheimia; Nucleatula* and *Juvavella*, two new genera of the Centronelline type of Terebratulidæ; long-beaked forms of *Retzia;* most of the diplospire *Spirigeræ;* the septate *Spirigeræ* (*Amphitomella*); *Mentzelia*, a subgenus of *Spiriferina;* the doubtful *Badiotella;* and some peculiar *Cyrtinæ*.

Turning now to Part II. of the work, we may note the following details concerning some of the above forms.

The numerous groups of *Spiriferina*, though convenient, are of uncertain value; for it is uncertain whether, in determining affinities, more weight should be attached to the structure of the beak or to the ribbing. Ribbing varies greatly in forms with the same beak-structure, *e.g.* the *Hirsuta* group. This is an instructive instance of the difficulty of classifying on other grounds than those of phylogenesis.

The *Cyrtinæ* are interesting. *C. Fritschii* is a new species in which the pseudo-deltidium, which in other Brachiopods is a single plate closing in the peduncular aperture, consists of two rows of separate scale-like plates alternating with one another. *C. Buchii* and *C. Zittelii* appear to have been attached, at least in youth, by the apex of the larger valve, which is often curiously distorted. This fact may explain the pseudo-deltidium of *C. Fritschii*, for it may have been flexible to allow of the passage of a short peduncle or byssus. These forms lead up to *Cyrtotheca*, which was attached by one of the broad surfaces supporting the beak of the larger valve. The unique original of this genus has unfortunately been lost.

The genus *Spirigera* is divided into numerous groups, many of which have a secondary lamella running alongside of the main lamella that supports the spires of the lophophore; they are therefore said to be "diplospire." This structure is extremely rare in Palæozoic species of the genus.

The Koninckinidæ form the most widely distributed family of the Upper Alpine Trias; and of it, as well as of the four genera belonging to it, a complete description is given. In Mr. Bittner's opinion this family has been shown by the researches of Mr. Zugmayer to be closely allied to the Spiriferidæ. The lophophore support is diplospire. *Amphiclinodonta*, a new genus of this family, has an extremely complicated hinge and teeth.

Badiotella is a remarkable genus founded on a single unsymmetrical large valve. Its resemblance to *Streptorhynchus* suggests that it is probably a relic of the Strophomenidæ.

Juvavella and *Nucleatula* are two new genera of the Centronellinæ found in the Hallstatt limestone. This group has not hitherto been found in rocks of so late an age.

The general relations of the Triassic Brachiopods of the Alps may be summarized as follows:—

In the Lower Trias there are only two species, a *Lingula* and a *Discina*.

In the Muschelkalk there are forty-two species, referable to *Lingula*, *Discina*, *Terebratula*, *Waldheimia*, *Rhynchonella*, *Spirigera*, *Retzia*, *Spiriferina*, and *Mentzelia*. All these, in closely allied or even identical forms, appear again in the Upper Trias.

The Upper Trias contains over 300 species, including all the types already mentioned. This, therefore, is a truer representation of the Brachiopod fauna of the Triassic period. The faunas of the Lower and Middle Trias are less, merely because the conditions were no so favourable in the Alpine area.

In the Triassic fauna hingeless genera are very rare.

Among the hinged genera two families, each containing over 100 species, are noticeable: the Spiriferidæ for the large number of genera, subgenera, and minor groups, combined with a paucity of individuals; the Rhynchonellidæ for the large number of individuals, with few well-marked genera or subgenera. The philosophic naturalist is tempted to suggest that the few divisions recognized in the latter family may be due to the very richness of the material.

The spire-bearers almost exactly equal the non-spire-bearers in the number of species. The latter, however, exceed in individuals, and, from this period onwards, increase in importance, while the spire-bearers soon disappear from the rock record. It is, therefore, very noteworthy that, just before their extinction, the spire-bearers should not only develop new branches—the Koninckinidæ and (?) Thecospiridæ—but should also break up into so many genera, subgenera, and minor groups. A similar efflorescence, as Mr. Bittner observes, marked the later history of the Terebratulidæ, a family now almost extinct.

These facts are certainly opposed to the statement of Hyatt that stems give off numerous forms in their early youth, when the field is free, but not in old age, when they begin to be crowded out by the struggle for existence. Possibly, however, the opposition is more apparent than real, and will disappear when the Brachiopoda shall have been studied under the guidance of modern principles of evolution. Such a study has begun in America, but we regret to see little sign of it in the present work. No doubt Mr. Bittner is only waiting to complete his knowledge, before entering on a field where he will meet with worse obstacles than hard rocks and battered specimens—with illusion and ignorance, prejudice and envy, obstinacy and superstition. When he does start, we shall be the first to wish him good speed.

F. A. BATHER.

A TEXT-BOOK OF POLITICAL ECONOMY.

Elements of Economics of Industry. Being the first volume of "Elements of Economics." By Prof. Alfred Marshall. (London: Macmillan and Co., 1892.)

THE nomenclature of this work reminds us of the ancient custom according to which the alternate generations of a family were named alike. As the son of Hipponicus was called, not after Hipponicus, but after Hipponicus' father, Callias; so the "Economics of Industry," though sprung from the "Principles of Economics," of which it is a miniature, yet does not derive its title from that work, but from the predecessor of that work, the well-known text-book which saw the light some thirteen years ago. The first and the second "Economics of Industry" are unlike in form; but a general family resemblance may be traced between the two generations. A sort of reversion is presented by the circumstance that trades unions are discussed in the latest as in the earliest of our author's books; but not in the intermediate "Principles of Economics." The character of the "Economics of Industry" the younger, and its position in the family group, may best be indicated if, comparing it with its immediate predecessor, the second edition of the "Principles of Economics," we notice what has been retained what has been omitted, and what has been added.

The fundamental principles of political economy as enounced by Prof. Marshall in his *magnum opus*, have been transferred to the pages before us without alteration. The conception of economics as he science of measurable—not necessarily selfish—motives is again the starting-point. Thence we are led to the construction of demand-curves, and that construction by which the benefit which the consumer derives from fall in price is represented. Corresponding to demand-curves and "consumer's rent" are, on the other side of the counter, so to speak, supply-curves and rent proper. But the correspondence is not close, and the diagrammatic representation of the conditions of supply presents peculiar difficulties. It is perplexed by the principles of "increasing" and "decreasing returns." Difficulty is caused by the distinction—first clearly indicated by Prof. Marshall—between "long periods" and "short periods." An effort is required to realize the idea of supply, as it were, projected through time—the vast conception of skilled work put upon a future labour-market by parental providence for vicarious remuneration. The forces of demand and supply determine price, acting simultaneously, in the sense in which equations are called simultaneous. "Just in the same way, when several balls are lying in a bowl, they mutually determine one another's position." The law of demand and supply—the gravitation of the economic system—governs widely distant spheres; not only exchange in the proper narrow sense, but also distribution. Prof. Marshall was, we believe, the first clearly to discern this identity. But, while contemplating the unity of the genus, he has not lost sight of the diversity of the species. No one else has so fully enumerated and allowed for what may be called the *propria* of the different markets; such as the circumstance that many of the disadvantages in bargaining to which the workman is subject are *cumulative*. It is this union of wide general views with minute knowledge of concrete details which imparts peculiar weight to Prof. Marshall's recommendations respecting questions of practical moment, such as the limitation of the hours of labour.

These lessons have now been made easier by the omission of much that is accessory and abstruse in the original volume; in particular, the literary criticisms and the mathematical demonstrations. Among the latter class of omissions two seem conspicuous: the difficult formula for discounting future pleasure, and what may be called the higher theory of the supply-curve, including its possible plural intersection with the demand-curve. Difficult, the present writer may well call these theories, for he has to confess that he was mistaken in some strictures passed upon them in a review of the first edition of the "Principles of Economics" (NATURE, August 14, 1890). The fuller statements about those subjects contained in the second edition made it evident that there had occurred what more frequently occurs than is acknowledged: the author was right, and the critic was wrong. The little incident may be referred to as justifying the plan of abridgment which has been adopted—by omission rather than compression of difficult demonstrations. "It seemed that the difficulty of an argument would be increased rather than diminished by curtailing it and leaving out some of its steps." There results a text-book eminently fitted for the purpose of education, embodying the result of original reflections in a shape adapted to the needs of beginners; complete in itself, yet capable of being supplemented by the judicious teacher who, referring to the "Principles of Economics," may point to that higher world of thought and lead the way.

Practical exigencies have induced Prof. Marshall to forestall the discussion of trade unionism which may be expected in the second volume of the "Principles of Economics." In the work before us he thus states the claim of unions to make economic friction act in favour of the workman:—

> "A viscous fluid in a vessel tends to form a level surface; but, if from time to time an artificial force pushes down the left side, which we may take to correspond to wages, it may reasonably be maintained that the average position of the left side is lower than it would have been without such interference, in spite of the in-